Effects of Antennectomy, Dehydration and Superhydration on the Movements of *Helix aspersa* (Mollusca : Gastropoda)

BY

ANDREA H. NASH

5818 Jumilla Avenue, Woodland Hills, California 91364

AND

FRED HERZBERG

Department of Anatomy, School of Medicine, UCLA Center for the Health Sciences, Los Angeles, California 90024

ALTHOUGH MOISTURE RECEPTORS are known for some animals (GUNN, 1937; BENTLEY, 1944; and others) we have been unable to find any evidence concerning their location in terrestrial snails. However, it is well known that *Helix aspersa* does respond to moisture, and some experimental work has been done on this (HERZBERG & HERZBERG, 1962). The effects of an animal's previous hydration upon its preference for dry or moist areas have also been studied (KENNEDY, 1937; and others).

The upper two tentacles of *Helix aspersa* are eye stalks and the lower two are thought to be olfactory organs (PROSSER, 1950). This study was designed to determine 1) whether the two lower tentacles of *Helix aspersa* contain humidity receptors as do the antennae of some other animals, and 2) whether previous dehydration or environmental saturation with water influences the preference of this animal for a moist environment.

MATERIAL AND METHODS

This study was carried out between July 31, 1961 and August 18, 1961 with specimens of *Helix aspersa* gathered from a garden in Woodland Hills, California. There were four groups of 35 snails each. The snails in Group 1 were kept in glass jars of one quart capacity, 5 snails per jar, with a layer of dry soil, 5 cm thick, in the bottom of each. The tops of the jars were covered with aluminum screening. No water was supplied at any time. The snails in Group 2 were kept in similar jars for the same period of time but the soil in these jars was kept wet, with a water level readily apparent. Both groups were provided with equal and more than adequate amounts of fresh lettuce. The snails in Group 3 were gathered after Groups 1 and 2 had been kept for 13 days. The lower two tentacles of each of the snails in Group 3 were amputated with sharp scissors. The animals were not disturbed by the procedure and continued to move about as before, nor was there any fluid loss apparent following antennectomy. The snails in Group 4 were gathered on the same day as those in Group 3 to serve as controls. All snails were identified by markings in red nail polish on the shells. All four groups were then placed into a wooden box, 45 cm by 45 cm, with a height of 4 cm, exclusive of 4 cm of soil in the bottom of the box. A wooden divider extending from the bottom of the box to the aluminum screen covering the top of the box, was placed in its exact center in a manner which would divide the box into two equal parts. A gap of 7½ cm was left at one end of the divider, giving the snails access from one side of the box to the other through this opening. The soil on the side of the box into which the snails were placed was left entirely dry and the other side was kept constantly moist, with the soil almost muddy in consistency. Adequate amounts of fresh lettuce were supplied equally to both halves of the box. The snails in the previously dry group (Group 1) had, without exception, sealed themselves off within their shells. The epiphragms with which they were sealed often broke when the animals were removed from the jars. Therefore all of the epiphragms left intact were broken by the experimenters in order to give each of the snails an equal opportunity to react to the presence of moisture.

The snails were placed into the wooden box at 1:30 p. m. on August 13 and were observed at various times until 3:00 p. m. on August 18. The number of snails from each group present on the wet side was counted at each observation.

RESULTS

The number of snails from each group found on the wet side of the box at various times is shown in Table 1. Snails from Group 1 (dehydrated for 13 days) did not begin to move to the wet side until several hours after snails from the other groups had begun to do so. Fewer snails from this group than from any other were found on the wet side until 1½ days after the snails had been placed into the box. For a similar period more snails from the antennectomized group (Group 3) than from any other group were found on the wet side. After the 1½ day period the only consistent difference between the groups was the slight increase in the number of antennectomized snails on the wet side. A few of the dehydrated animals failed to emerge from their shells during the experimental period.

DISCUSSION

As one observes the activities of individuals of *Helix aspersa* in glass jars it appears that the lower tentacles are used by the animal to help feel its way over the soil or glass. However, the animals appear in no way incapacitated in their ability to move without these organs present. We have observed the use of the lower tentacles during courtship, when the snails seem to locate each other with the help of these organs. We did not test the antennectomized animals to ascertain whether the courtship process was affected. From the evidence acquired in this study it appears clear that the lower antennae are not required by this species when it expresses its need for moisture. This would indicate either that there are no moisture receptors in the lower antennae or, if present, that they are not important in seeking moisture.

SUMMARY

The preference of *Helix aspersa* for moist areas is not influenced by 13 days exposure to a wet or a dry environment. Snails kept dry for this length of time have a latent period of several hours before they begin to move. Antennectomized snails congregated in the moist areas in essentially the same numbers as did controls. dehydrated and superhydrated snails. It appears likely that moisture receptors are not limited to the lower antennae of this species, and may even be entirely absent from these organs.

Table 1

Chart showing the number of animals found on the wet side of the box at various time intervals.

Date	Time of day	Dehydrated	Superhydrated	Control	Antennectomized
8 / 13	13:30	0	0	0	0
	18:00	0	1	3	3
	22:00	0	2	4	6
	24:00	8	16	11	14
8 / 14	9:00	27	27	28	31
	20:00	25	26	31	32
	23:00	25	24	26	29
8 / 15	0:30	23	21	29	28
	10:00	30	24	20	30
	18:00	31	25	25	28
8 / 16	11:00	28	28	30	20
	18:00	29	29	29	20
8 / 17	9:00	23	28	32	24
8 / 18	15:00	27	29	32	30

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